XV. *On some unusual monstrous Insects.* By J. O. Westwood, M.A., F.L.S., &c.

[Read June 4th, 1879.]

(Plates VI. and VII.)

A. Insects with extra development of Wings.

In the various classifications of monstrous or abnormal productions of Nature which have been proposed by physiologists, a large and important division has comprised those individuals which possessed more than the ordinary structures of the type of the species. To such individuals the name of "Monstra per excessum" has been applied. By M. Lacordaire they were termed "Monstres polymèliens," from which the term of *Polymelianism* may be applied, to distinguish this form of monstrosity. Among the articulated animals (to which the name of *Arthropoda* is now applied) this kind of monstrosity is of comparatively moderate extent. In fact, no specimen has hitherto been described in which more than a single head or a single body has been found in the individual monster, the monstrosity being confined to an extra number of legs and antennæ, or joints of those organs. Of both of these abnormities the number of instances has been considerable, but additional wings or portions of wings are of such rare occurrence that no such instance is recorded by Lacordaire or other writers on Entomology.*

From this circumstance it may be inferred that there is a greater analogy between the legs and antennæ of an

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* M. Isidore Geoffroy Saint Hilaire divides Polymelian monsters into five genera: 1, *Pygomèlians* (where the additional members are affixed to the pelvic region);† 2, *Gastromèlians* (to the belly); 3, *Notomèlians* (to the back); 4, *Cephalomèlians* (to the head), and *Melomèlians* (to the other members). "Tous les cas observés jusqu'a ce jour, parmi les insectes appartiennent à la Mélomélie et l'on en connaît déjà un assez grand nombre, *qui tous portent sur les antennes et les pattes.*" Lacordaire, Introduction ii. p. 444.

† M. Lacordaire considers the statement of Paullin, "Ephemer. des Curieux de la Nature," Dec. iii. Ann. iii. p. 316, that he had observed a fly which had a third wing implanted on the podex, as unworthy of credit.

Arthropod than between those organs and the wings, and this, we know, is physiologically the case. Still, however, the instances which I am able to produce in this communication prove that the principle of extra development is as applicable to the wings as to the other limbs of insects.

The first specimen I have to describe is a *Gonepteryx Rhamni* (Pl. VI. fig. 1), which possesses an extra imperfectly-developed hind wing. It was taken by Mr. J. Woodgate, of Richmond Road, New Barnet, Herts. Looked at from above, the left hind wing is evidently broader than the right; in fact, the right-hand true wing is scarcely more than two-thirds of the normal size. In fig. 1*a* this double right-hand hind wing is represented from above, and in fig. 1*b*, from beneath. From both points of view it is evident that the normal anterior margin of the wing, indicated by the costal vein, *a*, properly developed, is shown in the supplemental wing in fig. 1*b*, *a*, whereas in fig. 1*a* the costal part of the true wing, with its costal vein, a^*, is imperfectly developed; the postcostal vein, with its two branches, b^1 and b^2, are normally arranged in the true wing, as are also the discoidal vein, *c*, and the median vein and its three branches, d^1, d^2 and d^3. In the supplemental wing (fig. 1*b*) the veins, except the costal one, are more or less abnormal; the subcostal, *b*, has only one branch, if we except a very slight indication of bifurcation close to its extremity; the discoidal vein, *c*, is, in like manner, imperfectly bifurcate at its extremity, which does not reach the outer margin of the wing, and the median vein, *d*, has only one branch, and is connected with the subcostal vein by two oblique discocellular veinlets closing the cell, and it is upon these veinlets that the characteristic orange patch, seen both on the normal and supplemental wing, is seen. From this description I think we are warranted in concluding that the true wing has been sacrificed, and that in the supplemental wing nearly the whole (except the costal portion) has been partially aborted. In the specimen only two legs exist on the side of the monstrous wings, but I was not able to examine it sufficiently, for fear of injury, to determine whether a third leg had been broken off. If not, could the extra wing have replaced the wanting leg?

The second specimen to be here noticed is a *Vanessa Urticæ* (Pl. VI. fig. 2), which was in the collection of the late J. F. Stephens, and of which I published a figure in my

"Butterflies of Great Britain, 1855," pl. vii. fig. 1. It was captured by Mr. Doubleday at Epping, and is now in the British Museum. The supplemental wing is here, as in the former specimen affixed at the base of the costal portion of the right hind wing, but here it is implanted on the upper side of the wing, and consequently hides the outer costal and postcostal portion of the true wing when seen from above; whereas in *G. Rhamni*, it is affixed on the under surface of the wing, and is therefore partially hidden by the costal portion of the true wing when seen from above. The supplemental wing is here much less developed than in the former case as shown in figure 2*b*, where the costal vein *a* is not fully developed, the subcostal vein *b* is destitute of its branch, the discoidal vein is entirely wanting, but the median vein has its three branches, d^1, d^2 and d^3, the last two, however, being united together previous to arriving at the hind margin of the wing, where in the true wing the most prominent point of the margin is produced.

The third specimen here represented (Pl. VI. fig. 3) is a male *Hipparchia Janira*, taken last year near Oxford, and now in the Hopeian Entomological Museum. On the upper side there is no apparent monstrosity, the uniform brown colour of the wings not allowing any irregularity to be observed. On the underside the case is different, as we here perceive on the left-hand hind wing an orange streak with a moderately-large eyelet let in between the subcostal and median portions of the wing, of which there is no trace in the right-hand hind wing, and on carefully examining the veins it is found that there is one vein which does not normally exist as shown in fig. 3*a* (the abnormal) and 3*b*, the normal wing; moreover, it is upon this extra vein and its neighbourhood that the fulvous colour and the extra eyelet is found; and as in no varieties of the male of this species are the hind wings orange coloured, we are led to the inevitable conclusion that this left-hand hind wing has been supplemented by that precise portion of an additional fore-wing which bears the discoidal veins and the large eyelet near the tip of the normal fore-wings.

B. Insects with imperfectly-developed Heads.

The other cases of insect monstrosity which I propose to bring before the notice of the Society are those in which the perfect insect retains some portion of the outer

covering of the larva, the pupa not having had sufficient strength entirely to get rid of the larva skin, so that the perfect insect has its head, for instance, enveloped not only in the cephalotheca of the pupa but also in that of the larva. This form of monstrosity constitutes all Lacordaire's fifth division "Monstres par arrêt de developpement" (Introd. ii. p. 441), of which he was only acquainted with two instances (p. 442), viz., Mueller's *Phalæna Heteroclita* and Wesmael's *Nymphalis Populi*, noticed below.

COLEOPTERA.

Cybister limbatus.—A specimen of this water beetle was captured by Mr. J. C. Bowring, swimming in water at Hong Kong, having the head of the imago replaced by that of the larva. The specimen is represented in Pl. VII. figs. 1 and 1*a*. It is noticed by Mr. F. Smith, "Proc. Ent. Soc. Lond.," ser. 2, vol. iv. p. 34, and by myself as a species of *Dytiscus* in the "Entomol. Monthly Mag.," No. 82, p. 239. The specimen is now in the British Museum. The anterior part of the head of the larva is broken off, but the very narrow neck has prevented the development of the widened jugulum of the imago.

Hydaticus bimarginatus.—Dr. John L. Leconte informed me that a specimen of this beetle retaining the head of the larva is in the collection of Dr. Helmuth, of Chicago.

Calyptocephalus fasciatus (G. R. Gray, in Griff. Ass. K. Ins., pl. xxxix. f. 5).—Pl. VII. fig. 2 represents a specimen of this Brazilian species of *Malacoderms* which has not had sufficient strength to throw off the prothoracotheca of the pupa, which still remains as a large white regular-shaped scale concealing the head and prothorax when seen from above. Fig. 2*a* shows the lateral view of the anterior part of the body, showing the prothorax disengaged except at its anterior part.

LEPIDOPTERA.

Gastropacha quercifolia.—A specimen of this moth, having the head entirely enveloped in the cephalotheca of

the larva, is represented in Pl. VII. fig. 6. It was in the collection of the late J. F. Stephens, and is now preserved in the British Museum.

Bombyx mori.—A small specimen of this species was exhibited by Mr. F. Bond at the Entomological Society of London, February 20, 1871, retaining the larval head. It has been presented to me by Mr. Bond, and is now in the Hopcian Entomological Museum at Oxford. It is represented, enlarged in Pl. VII. fig. 5. It has the wings crippled, but the head is entirely enveloped in the head of the larva as represented in fig. 5*a*, front view, fig. 5*b* seen sideways, showing the minute eyes of the larva.

Vanessa atalanta. — Pl. VII. fig. 4 represents the front of the body and head of a specimen of the Red Admiral butterfly which still retained the fractured cephalotheca of the larva covered with its minute conical tubercles, and which are represented as seen sideways in fig. 4*a*. The specimen was bred by a metropolitan collector, and was very perfect. It was lent to me for delineation by Mr. F. Bond, by whom it was exhibited at the Entomological Society of London on the 6th February, 1871. It was a male, as shown by the feathery anterior legs in fig. 4*a*. The hind part of the larval head was split, and partly lost. On looking obliquely through this slit at the point *, the light is seen through it, proving that the inclosed head of the animal did not occupy the anterior part of the skull of the caterpillar beyond the *. The inclosed portion which has oozed through the slit in the larval skull forms a convex hard mass of a blackish colour, tessellated with small luteous dots and marks, and which appears to me to be the skull of the true pupa. On the underside there are no traces visible of the antennæ cases (*ceratothecæ*), but a shapeless blackish mass is interposed between the skull of the larva and the front of the chest and fore-legs of the imago.

In an elaborate memoir, published by Dr. Hermann A. Hagen in the 2nd volume of the 'Memoirs of the Museum of Comparative Zoology' at Harvard College, Cambridge, Mass., on some insect deformities, the following instances

of *perfect Lepidopterous insects with the larval head* are described :—

Phalæna heteroclita subcristata of O. F. Mueller, Faun. Fredrichsalen, p. 47, and in the Mém. de Mathém. et de Phys. Acad. R. Sciences Par 1774, vol. vi. pp. 508—511, pl. 1. This insect (regarded by Mueller as a distinct species, by Hagen, Bibl. Ent. i. 556, as *Bombyx dispar*, by myself as one of the *Noctuidæ*, Introd. ii. p. 356, and by Lacordaire as a *Noctuelle*, Introd. ii. p. 442) appears rather to be a specimen of *Bombyx Psilura monacha*, as quoted by Werneburg, Beitr. z. Schm. i. 376, and cited by Hagen, p. 6.

Mueller gives a precise description of the head of his specimen, which was entirely enveloped in that of the larva, which he says consisted of "une membrane mince, qui a l'aide d'une loupe, laissait entrevoir une liqueur transparente agitée d'un mouvement continuel." The moth lived ten days, thus enabling its captor to observe this movement, which he repeats a second time: "On voit clairement le mouvement peristaltique de la liqueur sous la membrane triangulaire aussi bien que le mouvement des organes de la bouche," thus proving, as Dr. Hagen suggests, that "the insect must have been an imago with the head of the caterpillar preserved; not only with the skin covering the head of the imago preserved, but with a real head of the caterpillar, in which the circulation of the blood was still taking place and the maxillary organs were still moveable, a condition of the parts contrary to all our present knowledge of the anatomy and development of insects.

Nymphalis populi.—The late Professor Wesmael, of Brussels, captured a specimen of this species near that city, of which he published an account and figure in the Bull. Acad. Bruxelles, 1838, tom. iv. p. 359, with a coloured figure of the insect reproduced in Ann. Sci. Nat. ser. 2, vol. viii. p. 191, and Hagen, *ut supra*, p. 8, and plate, figs. 10, 11. The specimen was fully developed, except that the head was still entirely enveloped in the bicornuted cephalotheca of the larva, which the butterfly ineffectually endeavoured to get rid of by a quick motion of the fore-legs, trying to push it off. In dissecting the left side of the head, Prof. Wesmael discovered underneath the external skin a second one, much thinner than the outer, and beneath the second one the well-developed eye

of the imago ; and underneath the head of the caterpillar, and just above the skin of the chrysalis was the left antennæ coiled up, but without an apical knob,—it was covered by a very fine membrane, to a great extent diaphanous.

Morpho eurylochius.—I am indebted to Dr. H. A. Hagen for the very beautiful drawing of a specimen of this butterfly (reduced to half its natural size, copied in Pl. VII. fig. 3), of which a full-sized figure and description were published by him in his article in the Harvard College Memoirs above referred to.

In this specimen the cornuted head of the larva is perfectly preserved in shape and colour ; beneath the head the mentum is broken off near the prothorax, its lateral sutures are separated and the mentum hangs down as a kind of trap-door, being united with the head only by a small anterior lobe. The opening is large enough to show that the head of the larva is empty inside. The skin between the head and prothorax is still preserved in the shape of a contracted ring, which is open only for a small space beneath where the mentum is separated. The large dorsal plate of the prothorax is present and covers loosely the thorax of the imago, on the left side the external third is wanting. Dr. Hagen was not able to state whether any part of the skin of the chrysalis, either beneath the dorsal plate of the prothorax on the middle and on the right or on the entirely free left side of the thorax is present.

Vanessa antiopa.—Professor Zeller has described in the Isis, 1839, p. 259, a specimen of this butterfly retaining the head of the caterpillar in the usual vertical position. Having cut off a part of the left side a hollow space between the head of the caterpillar and the remaining parts of the insect was noticed ; behind the head, and not connected with it, the two anterior plates of the chrysalis are retained.

Pieris rapæ.—A chrysalis of this species is described by Dr. Hagen, p. 10, in which, in casting off the skin of the caterpillar, only the thoracic part of the chrysalis was developed, the head of the caterpillar was still present, but its sutures were separated. The dorsal split of the skin reaches to the first segment of the abdomen, and the

skin of the abdomen is retracted, but still present. A similar specimen has also been observed by Mr. S. H. Scudder.

Zygæna exulans, var. *Vanadis*.—Dr. Staudinger (Stettin. Ent. Zeit. 1861, xxii. p. 359), describes a larval-headed male of this species. The mouth parts of the larva were immovable in the living insect, the head was fastened to the prothorax, and moved only by the motion of the latter, which was fully developed beneath with its legs. Dr. Staudinger believed it impossible that the head of the imago was enclosed in this larval head.

Smerinthus tiliæ.—Prof. Van der Hoeven, Tijdshr. v. Natur. Gesch. vii. p. 279, mentions a caterpillar of this species which had not been able to cast off in the last moult the skin covering of the spine of the tail.

Sphinx, sp.—Dr. Hagen, op. cit. p. 11, mentions a sphinx captured by M. Trouvelot, having the head of the caterpillar.

Bombyx mori.—In the Tijdschrift voor Nat. Gesch. 1840, vol. vii. pp. 257—270, pl. 1, an interesting series of observations are published by J. J. Bruinsma, on chrysalids of the common silkworm, which had been taken out of the cocoon, having the upper part of the larval skin still remaining; one of which was subsequently transformed into a moth with the caterpillar head still remaining, the head of the caterpillar covering exactly the place where the head of the moth should be, so that nothing was to be seen of it, nor of its antennæ or eyes. The right part of the head was taken off, and beneath it the right antennæ was discovered, well formed, but coiled up. In taking off more of the skin, a well-formed eye of the perfect insect appeared. Several other chrysalids of the silk moth were also described and figured, retaining the head of the larvæ. Other specimens of the silk moths retaining the head of the larvæ (observed by Mr. Eindohven) were described in a supplemental note by Van der Hoeven, who also drew attention to a memoir by J. Jonston, in his Hist. Nat. de Insectis, Amstel. 1657, p. 123, and 1768, p. 176, concerning a male and female *B. mori*. In both the head of the larva was retained, covering the well-developed head of the imago.

Zerene adusta.—Dr. Hagen, op. cit. p. 13, records the transformation of a caterpillar of this species into a chrysalis which still retained the head of the larva.

Botys fuscalis.—Mr. Stainton exhibited to the Entomological Society of London a specimen of this moth with the head covered by part of the puparium; it was flying briskly when captured, the antennæ and haustellum were free, and the case of the latter projected downwards, like the rostrum of a Panorpa.

The deductions of Dr. Hagen, arising from the consideration of the preceding cases, are of considerable physiological importance, to which, however, I have not considered it necessary in this place to do more than allude thus briefly.

Psychoda auriculata.—Mr. Curtis (Brit. Ent. pl. 745) has represented in his figures of the genus *Psychoda* certain biarticulate appendages, two of which are attached to the anterior margin of the thorax of certain individuals of that genus. They seem to represent two biarticulated palpi, and were pointed out to him by Mr. Haliday. "They seem," says Mr. Curtis, "to be the analogues of those developed in the pupæ (as figured by Bouché, pl. 2, fig. 22), and it may be by accident that they are united to the prothorax or absorbed in their change to the imago, otherwise it would be difficult to explain the reason why they are not common to the genus."

From this circumstance Mr. Haliday named one species of the genus *Psychoda auriculata*.

The following case of the accelerated development of the imago is referred to by Lacordaire amongst his instances of imperfect Ecdysis, resulting from "précocité de développement" (op. cit. p. 443):—

According to Majoli (Giornale di fisica del regno italico, Pavia, 1803, t. v. p. 399, cited in Meckel's Deutsches Archiv. fur Physiologie. t. ii. p. 542, not quite correctly by Lacordaire, Introd. ii. p. 443, and by Dr. Hagen, from the original in Mem. Mus. Compar. Anat. Harvard Coll. t. ii. No. 9, 1876), the caterpillars of *Bombyx mori* are occasionally transformed after their fourth moulting without

spinning any cocoon. The perfect moths which are produced from these individuals exhibit a curious mixture of the parts of the imago and those of the larva; the head being small, furnished with two black compound eyes, the thorax is incomplete, having the third segment similar to the third ring of the larva; the abdomen also resembles that of the larva after its fourth moult both in form and the number of its segments. The hind wings are long and narrow, and the antennæ are greyish coloured, the fore-wings somewhat elongated and narrow, and the hind wings shorter and narrower (le ali superiori alquanto lunghe e ristrette, le inferiori più corte e strette). The cause of this irregular transformation is supposed by Majoli to be an excessive warm temperature in the breeding room, which prevents the caterpillar from producing the exudation of the fluids necessary for the formation of the chrysalis and obliges it to transform directly into the moth.

A somewhat similar instance of irregular development in a moth (*Orgyia antiqua* ?) was exhibited at the November Meeting of the Entomological Society, in which the larva skin had only been partially shed, whilst other parts of the insect had assumed the imago state, and others showed the pupa skin.

DIPTERA.

Eristalis tenax. — This specimen (Pl. VII. fig. 7), which is in the Hopeian Collection, is remarkable at first sight for the two frontal horns or processes arising from a transverse portion of the head-case of the larva, which is one of the rat-tailed species found in manure water. The head itself of the imago is distinct; but, as shown in figs. 7*a* and 7*b*, it is enveloped in the delicate pellicle or cephalotheca of the pupa.

Eristalis nemorum. — This specimen, the head of which is represented in fig. 8, is also in the Hopeian Collection, to which it was presented by Sir Sidney Saunders, agrees with the preceding in having retained the head-case and two elongated appendages of the larva on assuming the imago state.